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ABSTRACT

This document, which is intended for use by community and junior colleges throughout Mississippi, contains curriculum frameworks for the course sequences in the automotive technology programs cluster. Presented in the introductory section are a description of the program and suggested course sequence. Section I lists baseline competencies, and section II consists of outlines for each of the following courses in the sequence: electrical systems; brakes; manual drive trains and transaxles; basic fuel systems; basic engine performance; engine repair; computer controlled emission systems; heating and air conditioning; automatic transmissions and transaxles; computerized engine controls; steering and suspension systems; and wheel alignment. Each course outline contains some/all of the following: course name and abbreviation; course classification; course description; prerequisites; and competencies and suggested objectives. Recommended tools and equipment are listed in section III. Appended are lists of related academic topics and workplace skills for the 21st century and student competency profiles for both courses. (KC)

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Mississippi Curriculum Framework for Automotive Technology

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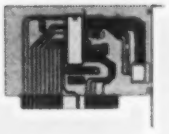

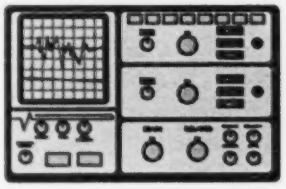

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Postsecondary Vocational and Technical Education 1995

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MISSISSIPPI

CURRICULUM FRAMEWORK

FOR

AUTOMOTIVE TECHNOLOGY PROGRAMS

(CIP: 47.0604 - Automotive Mechanic/Tech.)

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FOREWORD

In order to survive in today's global economy, businesses and industries have had to adopt new practices and procedures. Total quality management, statistical process control, participatory management, and other concepts of high performance work organizations are practices by which successful companies survive. Employers now expect their employees to be able to read, write, and communicate effectively; solve problems and make decisions; and interact with the technologies that are prevalent in today's workplace. Vocational-technical education programs must also adopt these practices in order to provide graduates who can enter and advance in the changing work world.

The curriculum framework in this document reflect these changes in the workplace and a number of other factors that impact on local vocational-technical programs. Federal and state legislation calls for articulation between high school and community college programs, integration of academic and vocational skills, and the development of sequential courses of study that provide students with the optimum educational path for achieving successful employment. National skills standards, developed by industry groups and sponsored by the U. S. Departments of Education and Labor, provide vocational educators with the expectations of employers across the United States. All of these factors are reflected in the framework found in this document.

Each postsecondary program of instruction consists of a program description and a suggested sequence of courses which focus on the development of occupational competencies. Each vocational-technical course in this sequence has been written using a common format which includes the following components:

- Course Name - A common name that will be used by all community/junior colleges in reporting students.
- Course Abbreviation - A common abbreviation that will be used by all community/junior colleges in reporting students.
- Classification - Courses may be classified as:
  - Vocational-technical core - A required vocational-technical course for all students.
  - Vocational-technical elective - An elective vocational-technical course.
  - Related academic course - An academic course which provides academic skills and knowledge directly related to the program area.
  - Academic core - An academic course which is required as part of the requirements for an Associate degree.
- Description - A short narrative which includes the major purpose(s) of the course and the recommended number of hours of lecture and laboratory activities to be conducted each week during a regular semester.

- Prerequisites - A listing of any prerequisite courses that must be taken prior to or on enrollment in the course.
- Competencies and Suggested Objectives - A listing of the competencies (major concepts and performances) and of the suggested student objectives that will enable students to demonstrate mastery of these competencies.

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75 percent of the time allocated to each course. For example, in a four semester hour course consisting of 30 hours lecture and 120 hours of laboratory activities, approximately 22 hours of lecture and 90 hours of lab should be taken by the competencies and suggested objectives identified in the course framework. The remaining 25 percent of each course should be developed at the local district level and may reflect:
  - Additional competencies and objectives within the course related to topics not found in the State framework, including activities related to specific needs of industries in the community college district.
  - Activities which develop a higher level of mastery on the existing competencies and suggested objectives.
  - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed/revised.
  - Activities which implement components of the Mississippi Tech Prep initiative, including integration of academic and vocational-technical skills and coursework, school-to-work transition activities, and articulation of secondary and postsecondary vocational-technical programs.
  - Individualized learning activities, including worksite learning activities, to better prepare individuals in the courses for their chosen occupational area.

- Sequencing of the course within a program is left to the discretion of the local district. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors.

- Programs that offer an Associate of Applied Science degree must include a minimum 15 semester credit hour academic core. Specific courses to be taken within this core are to be determined by the local district. Minimum academic core courses are as follows:

- 3 semester credit hours Math/Science Elective
- 3 semester credit hours Written Communications Elective
- 3 semester credit hours Oral Communications Elective
- 3 semester credit hours Humanities/Fine Arts Elective
- 3 semester credit hours Social/Behavioral Science Elective

It is recommended that courses in the academic core be spaced out over the entire length of the program, so that students complete some academic and vocational-technical courses each semester. Each community/junior college has the discretion to select the actual courses that are required to meet this academic core requirement.

- In instances where secondary programs are directly related to community and junior college programs, competencies and suggested objectives from the high school programs are listed as Baseline Competencies. These competencies and objectives reflect skills and knowledge that are directly related to the community and junior college vocational-technical program. In adopting the curriculum framework, each community and junior college is asked to give assurances that:
  - students who can demonstrate mastery of the Baseline Competencies do not receive duplicate instruction, and
  - students who cannot demonstrate mastery of this content will be given the opportunity to do so.

- The roles of the Baseline Competencies are to:
  - Assist community/junior college personnel in developing articulation agreements with high schools, and
  - Ensure that all community and junior college courses provide a higher level of instruction than their secondary counterparts

- The Baseline Competencies may be taught as special "Introduction" courses for 3-6 semester hours of institutional credit which will not count toward Associate degree requirements. Community and junior colleges may choose to integrate the Baseline Competencies into ongoing courses in lieu of offering the "Introduction" courses or may offer the competencies through special projects or individualized instruction methods.

- Technical elective courses have been included to allow community colleges and students to customize programs to meet the needs of industries and employers in their area.

ACKNOWLEDGEMENTS

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PROGRAM DESCRIPTION

AUTOMOTIVE TECHNOLOGY

Postsecondary Automotive Technology is an instructional program that prepares individuals to engage in the servicing and maintenance of all types of automobiles. Instruction includes the diagnosis of malfunctions and repair of engines, fuel, electrical, cooling, brake systems, and drive train and suspension systems. Instruction is also provided in the adjustment and repair of individual components such as transmissions and fuel systems.

PROGRAM REQUIREMENTS

Postsecondary Automotive Technology is an articulated certificate/technical program designed to provide advanced and technical skills to its students. Baseline competencies, taken from the secondary Automotive Mechanics curriculum framework, serve as a foundation for the competencies and suggested objectives taught in the courses of the program. Students who do not possess these competencies will be allowed to acquire them during the program. Students who can document mastery of the baseline competencies will receive advanced instruction on these topics. Automotive Technology may be taught as either a certificate program or as a technical program.

The curriculum for Postsecondary Automotive Technology is based upon the task list published in ASE Certification for Automobile Training programs. This task list serves as a national standard for certification of automobile technician training programs and is regularly reviewed and validated by technicians and engineers in the automotive industry. The task list is based upon the following assumptions which also apply to the model curriculum:

1. *In all areas, appropriate theory, safety, and support instruction is required for performing each task. It is assumed that this instruction has included identification and use of appropriate tools and testing and measuring equipment required to accomplish certain tasks. It is also assumed that the student has received necessary training to locate and use current reference and training materials from accepted industry publications (in most cases, published by the vehicle manufacturer), which present manufacturers' recommended or required specifications and procedures for performing various tasks.*

2. *All diagnostic and repair tasks described in this document are to be accomplished in accordance with manufacturer's recommended procedures and specifications.*

3. *The individual training program being evaluated for certification should have written and detailed performance standards for each task taught in the curriculum. Learning progress of students should be monitored and evaluated against these performance standards. A system should be in place which informs all students of their individual progress through all phases of the training program.*

4. *It is recognized that individual courses of study will differ across automobile technician training programs. The development of appropriate learning delivery systems and tests which monitor student progress will be the responsibility of the individual training program.*

(Adapted from ASE certification for automobile training programs. National Institute for Automotive Service Excellence, Reston, VA. 1993.)

For additional information on ASE Certification, contact:

National Automotive Technicians Education Foundation
13505 Dulles Technology Drive
Herndon, VA 22071-3415
(702) 713-010

The curriculum for Automotive Technology is designed to serve as the core of instruction for approximately seventy-five percent of each Automotive Technology Course. The remaining twenty-five percent of each course is to be added at the local level based upon needs of students and local employers.

Certificate programs in Automotive Technology require a minimum of 32 semester hours credit. Technical programs in Automotive Technology require a minimum of 64 semester credit hours. Fifteen semester credit hours of academic core courses are included in the technical program.

AUTOMOTIVE TECHNOLOGY

SUGGESTED COURSE SEQUENCE*

Baseline Competencies for Automotive Technology**

FIRST YEAR

4 sch	Electrical Systems (ATT 1114)	3 sch	Basic Fuel Systems (ATT 1513)
3 sch	Brakes (ATT 1213)	4 sch	Basic Engine Performance (ATT 1414)
5 sch	Manual Drive Trains/Transaxles (ATT 1315)	5 sch	Engine Repair (ATT 1715)
3 sch	Written Communications Elective	3 sch	Math/Science Elective
15 sch		15 sch	

SECOND YEAR

4 sch	Computer Controlled Emission Systems (ATT 2524)	5 sch	Computerized Engine Controls (ATT 2535)
4 sch	Heating and Air Conditioning (ATT 2614)	4 sch	Steering and Suspension Systems (ATT 2334)
5 sch	Automatic Transmissions/Transaxles (ATT 2325)	3 sch	Wheel Alignment (ATT 2343)
3 sch	Humanities/Fine Arts Elective	3 sch	Oral Communication Elective
		3 sch	Social/Behavioral Science Elective
16 sch		18 sch	

* Students who lack entry level skills in math, English, science, etc. will be provided related studies.

** Baseline competencies are taken from the high school Automotive Mechanics program. Students who can document mastery of these competencies should not receive duplicate instruction. Students who cannot demonstrate mastery will be required to do so.

SECTION I:

BASELINE COMPETENCIES

BASELINE COMPETENCIES FOR AUTOMOTIVE TECHNOLOGY

The following competencies and suggested objectives are taken from the publication *Mississippi Curriculum Framework for Automotive Mechanics*. These competencies and objectives represent the baseline which was used to develop the community/junior college Automotive Technology courses. Students enrolled in postsecondary courses should either (1) have documented mastery of these competencies, or (2) be provided with these competencies before studying the advanced competencies in the Automotive Technology program.

Baseline competencies may be integrated into existing courses in the curriculum or taught as special "Introduction" courses. The "Introduction" courses may be taught for up to six semester hours of institutional credit and may be divided into two courses. If the Baseline Competencies are to be taught as "Introduction" courses, each course should be at least 3 credit hours. The following course number(s) and description should be used:

Course Name(s): Introduction to Automotive Technology, Introduction to Automotive Technology I, or Introduction to Automotive Technology II

Course Abbreviation(s): ATT 100(3-6), ATT 1013, ATT 1023

Classification: Vocational-Technical Core

Description: These courses contain the baseline competencies and suggested objectives from the high school Automotive Mechanics curriculum which directly related to the community college Automotive Technology program. The courses are designed for students entering the community college who have had no previous training or documented experience in the field. (3-6 semester hours based upon existing skills for each student. May be divided into 2 course for a maximum total of 6 hours of institutional credit.)

Competencies and Suggested Objectives:

1. Review occupational and leadership opportunities in automotive mechanics.
   a. Investigate occupational opportunities in the local area.
   b. Update the student's Career/Educational Plan.
   c. Describe leadership opportunities available from student youth organizations in the school and community, including VICA.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

2. Demonstrate safety procedures used in automotive service.
   a. Apply safety rules for personal and general shop safety including eye(State Eye Safety Law provisions), ear, and body protection; general rules of shop conduct; and the use of safety color coding in automotive shops.
   b. Apply general safety rules for tool and shop equipment use including use of hand tools, air and electric power tools, and other shop equipment.
   c. Apply general safety rules associated with working on various vehicle systems.
   d. Apply rules and procedures associated with fire safety including procedures for handling and storing flammable liquids and proper use of fire fighting devices.

   Related Academic Topics (See Appendix A): C2, C4, S5, S6, S8
   Workplace Skills (See Appendix B): WP5
3. Demonstrate procedures for handling, storing, and disposing of hazardous materials, as per current federal and state regulations.
   a. Recognize signal words and symbols that indicate severity of a hazard.
   b. Describe methods for reducing hazardous waste.
   c. Describe procedures for storing hazardous waste.
   d. Interpret data found on a hazardous material safety data sheet.
   e. Describe general safety procedures for first aid and cleanup to follow in case of an accident involving hazardous materials.
   f. Demonstrate procedures for handling, storing, and disposing of hazardous materials.

   Related Academic Topics (See Appendix A): C1, C2, C4, S5, S8
   Workplace Skills (See Appendix B): WP2, WP3, WP4, WP5, WP6
4. Demonstrate safe and proper use and storage of tools and equipment in an automotive shop.
   a. Identify and demonstrate the safe and proper use of common hand tools including wrenches, sockets, pliers, screwdrivers, striking tools, etc.
   b. Identify and demonstrate the safe and proper use of lifting and hoisting equipment.
   c. Identify and demonstrate the safe and proper use of cleaning equipment.
   d. Identify and demonstrate the safe and proper use of power equipment including impact wrenches, drills, grinders, and presses.
   e. Organize and maintain a systematic storage system for hand and power tools.

   Related Academic Topics (See Appendix A): C2, C4, S8
   Workplace Skills (See Appendix B): WP1, WP5, WP6
5. Locate and apply service specifications and information.
   a. Locate service specifications and information, using both print and computerized service information references.
   b. Interpret and apply information to a specific job on a specific vehicle.
   c. Locate and interpret vehicle and major component identification numbers (VIN, certification, and calibration labels).

Related Academic Topics (See Appendix A): C1, C4, M1, M4, S8
Workplace Skills (See Appendix B): WP2, WP5, WP6

6. Demonstrate measurement practices used in automotive service.
   a. Measure length of an object using a rule to the nearest 1/16th of an inch and nearest 1 millimeter.
   b. Measure inside diameter, outside diameter, and/or depth to the nearest .001 of an inch and nearest .1 millimeter, using precision measuring instruments (micrometers, calipers, and dial indicators).

   Related Academic Topics (See Appendix A): M4, S8
   Workplace Skills (See Appendix B): WP2, WP5
7. Identify common fasteners and describe their use.
   a. Identify the different types of bolts, nuts, and washers and describe their appropriate uses.
   b. Identify bolts by grade, diameter, length, and thread pitch.
   c. Identify different glues and sealants used in automotive service and describe their appropriate use.
   d. Restore internal and external threads.

   Related Academic Topics (See Appendix A): C2, M1, M5, S6
   Workplace Skills (See Appendix B): WP2, WP5, WP6
8. Identify and describe the major systems and components of an automobile.
   a. Identify the major components and describe their purpose/function of following major systems:
      i. power train
      ii. chassis, steering, and suspension
      iii. fuel
      iv. electrical
      v. cooling
      vi. exhaust
   b. Describe the operation of a four-stroke cycle engine.
   c. Describe the use of electronics and computer control in modern automobiles.

   Related Academic Topics (See Appendix A): C1, C2, C4, S4
   Workplace Skills (See Appendix B): WP2, WP4, WP5
9. Perform lubrication maintenance and general inspection service.
   a. Discuss the importance of regularly scheduled maintenance procedures as outlined in the owner's manual and related to vehicle performance and longevity.
   b. Complete a work order and maintenance record for a given vehicle.
   c. Visually inspect the engine lubrication system for leaks and determine needed repairs.
   d. Select proper lubricants and filters for lubrication service.
   e. Change engine oil and filter according to manufacturer's specifications and in accordance with disposal procedures.
   f. Perform a chassis and body lubrication.

g. Inspect and service as needed other filters on the engine including air, fuel, pcv valve, crankcase vent filters, etc.
h. Conduct a general preventive maintenance inspection of hoses and belts, fluid levels, wiper blades, headlights and accessory lights, tires, exhaust, shocks, etc; repair/replace/adjust as needed.
i. Clean and service a battery including case, cables and connections, and checking electrolyte level (If applicable). (Maintain electronic memory functions while cleaning.)

Related Academic Topics (See Appendix A): C6, M4, S5, S6, S8
Workplace Skills (See Appendix B): WP1, WP2, WP4, WP5

10. Perform cooling system maintenance.
    a. Drain and refill a cooling system.
    b. Inspect and pressure test a cooling system for proper operation, repair/replace thermostats, hoses, radiator caps, etc as needed.
    c. Test condition and strength of antifreeze/coolant.

    Related Academic Topics (See Appendix A): C4, M1, S5, S6
    Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6
11. Perform wheel and tire service.
    a. Identify types and classifications for tires.
    b. Remove and install a wheel assembly to manufacturer's torque specifications.
    c. Inspect tires for proper inflation and abnormal wear.
    d. Dismount, repair, and remount a tire on a wheel.
    e. Balance a tire to industry standards.
    f. Rotate tires following vehicle manufacturer's recommendations.
    g. Diagnose and determine needed repair for abnormal tire wear, to include recognizing symptoms of incorrect camber, caster, and toe alignment.

    Related Academic Topics (See Appendix A): C1, C4, M4, S5, S6
    Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6
12. Perform a basic overhaul of the brake system.
    a. Describe basic hydraulic principles and brake operations, including selection and handling/storage of brake fluid.
    b. Compare the operation of a standard brake system to an anti-lock brake system.
    c. Discuss procedures for dismantling and cleaning brake system parts, including protection from hazards associated with asbestos brake pads and shoes.
    d. Inspect and diagnose brake system problems; identify needed repairs.
    e. Perform a basic overhaul for a disk type brake to include replacing pads, turning rotors, repacking wheel bearings, replacing seals, and replacing calipers.
    f. Perform a basic overall for a drum type brake to include replacing shoes, turning drums, checking and replacing other parts as needed.
    g. Remove, bench bleed, and replace a master cylinder.

h. Check and repair/replace damaged brake lines.
i. Bleed the brake system.

Related Academic Topics (See Appendix A): C1, C4, M4, S6, S8
Workplace Skills (See Appendix B): WP2, WP4, WP5

13. Apply basic electrical principles as related to automobile circuits.
    a. Describe the flow of electricity in a simple circuit including voltage, amperage, and resistance.
    b. Demonstrate the use of electrical test instruments including multimeters and continuity testers to measure voltage, amperage, and resistance.
    c. Interpret wiring diagrams for a given vehicle circuit including tracing the flow of electricity in the circuit and identifying electrical symbols in the diagram.
    d. Construct a simple DC circuit and test for power and continuity.
    e. Diagnose an electrical circuit (horn, turn signal, etc.) for power; repair as needed.

    Related Academic Topics (See Appendix A): C2, M1, M4, S6, S8
    Workplace Skills (See Appendix B): WP2, WP4, WP5, WP6
14. Perform basic charging and starting system service.
    a. Start a car using jumper cables or auxiliary power supply.
    b. Perform battery capacity (load, high rate discharge) test and determine needed repairs, including slow/fast battery charge.
    c. Remove and replace a battery.
    d. Perform a starter draw test and a starter voltage drop test and determine needed repairs.
    e. Diagnose charging system problems that cause undercharge, overcharge, or no charge condition.
    f. Remove and replace an alternator.
    g. Remove and replace a starter.

    Related Academic Topics (See Appendix A): C2, C6, M4, S5, S6, S8
    Workplace Skills (See Appendix B): WP2, WP4, WP5
15. Inspect and evaluate engine mechanical condition.
    a. Describe common parts failures and wear points in a four cycle engine.
    b. Perform a compression test.
    c. Perform a cylinder leakage test.
    d. Diagnose unusual engine noise and vibrations and determine needed actions.
    e. Diagnose unusual exhaust color, odor, and sound; determine needed repairs.

    Related Academic Topics (See Appendix A): C2, C6, M4, S5, S6
    Workplace Skills (See Appendix B): WP2, WP4, WP5
16. Perform basic service on an engine.
    a. Verify correct camshaft timing; determine needed action.
    b. Grind a valve and valve seat to correct specifications.
    c. Adjust valves on engines with mechanical or hydraulic lifters.

Related Academic Topics (See Appendix A): C1, C2, M4, S6
Workplace Skills (See Appendix B): WP2, WP4, WP5

17. Perform basic service on the fuel system.
    a. Compare the operating principles of a carburetor system to a fuel injection system.
    b. Replace fuel filters according to manufacturer's schedule and procedures.
    c. Inspect and test mechanical and electrical fuel pump and pump control; replace as needed.
    d. Inspect fuel tank and fuel cap; inspect fuel lines, fittings, and hoses; and repair as necessary.
    e. Diagnose fuel system related problems such as hard or no starting, engine misfire, hesitation, stalling, etc.; determine needed actions.

    Related Academic Topics (See Appendix A): C1, C4, M4, S5, S6
    Workplace Skills (See Appendix B): WP2, WP4, WP5
18. Perform basic service on the ignition system.
    a. Compare the operating principles of a conventional (distributor-type) system to an electronic ignition system.
    b. Inspect and test primary and secondary ignition system components including spark plugs and wires, determine needed repairs.
    c. Check and adjust ignition timing as needed.

    Related Academic Topics (See Appendix A): C1, C4, S6
    Workplace Skills (See Appendix B): WP2, WP4, WP5
19. Perform basic service on the emission control system.
    a. Explain the operating principles of the emission control systems including AIR, heated air induction, early fuel evaporation, EGR, PCV, evaporative emissions, and catalytic converter.
    b. Identify and locate the major components on each system on the vehicle.
    c. Diagnose operation of various components of the computer-controlled engine management system using a hand-held scan tool and multimeter.

    Related Academic Topics (See Appendix A): C4, C6, S5, S6
    Workplace Skills (See Appendix B): WP2, WP4, WP5
20. Perform basic drive line service/repair.
    a. Inspect, diagnose, and replace universal joints.
    b. Remove and replace axle bearings and seals as needed.
    c. Measure differential backlash using a dial indicator.
    d. Inspect and diagnose constant-velocity (CV) joint noise and vibration problems.
    e. Remove and replace a CV-axle assembly.

    Related Academic Topics (See Appendix A): C4, M4, S6
    Workplace Skills (See Appendix B): WP2, WP4, WP5
21. Perform clutch service.
    a. Remove, inspect, make needed repairs, and reassemble a clutch assembly to include flywheel, pressure plate, disc, and release assembly.
    b. Adjust clutch linkage for free travel.

Related Academic Topics (See Appendix A): C4, M4, S6
Workplace Skills (See Appendix B): WP2, WP4, WP5

22. Perform basic automatic transmission service.
    a. Compare the operation of a conventional transmission to the operation of an electronic transmission, including precautions to be followed in routine service of electronic transmissions.
    b. Service a transmission to include changing fluid and filters.
    c. Visually inspect transmission including checking for leaks and examining condition of fluid.

    Related Academic Topics (See Appendix A): C4, S6
    Workplace Skills (See Appendix B): WP2, WP4, WP5
23. Perform steering system service.
    a. Describe the procedures for four wheel alignment.
    b. Compare operation of a convention steering system to a rack-and-pinion system.
    c. Inspect components for wear or damage and replace/repair as needed.

    Related Academic Topics (See Appendix A): C4, C6, M4, M5, S6
    Workplace Skills (See Appendix B): WP2, WP4, WP5
24. Perform suspension system service.
    a. Compare the various types of suspension systems to include conventional, strut-type, and electronic.
    b. Inspect suspension components and determine needed repairs.
    c. Inspect shock absorbers and replace as needed.
    d. Inspect struts and replace as needed.

    Related Academic Topics (See Appendix A): C4, M4, S6
    Workplace Skills (See Appendix B): WP2, WP4, WP5
25. Perform basic heating system service.
    a. Describe the basic operation of a heater to include the parts and their functions.
    b. Test the operation of the heating system including motor and vacuum controls and determine needed repairs.
    c. Pressure test the system to determine leaks.

    Related Academic Topics (See Appendix A): C4, C6, S6
    Workplace Skills (See Appendix B): WP2, WP4, WP5
26. Perform basic air conditioning system service.

    (**NOTE:** All practices and procedures performed on sealed air conditioning systems **must** be performed under the direct supervision of an instructor who is certified to service air conditioning and refrigeration equipment. All practices and procedures **must** be performed in accordance with current mandates, standards, and regulations regarding refrigerant systems.)
    a. Describe the basic operation of the air conditioning system to include the parts and their functions.
    b. Test the operation of the air conditioning system including measuring system operating pressure on the high and low sides.
    c. Evacuate/discharge an AC system and recharge the system.

d. Check the system for leaks and determine needed repairs.
Related Academic Topics (See Appendix A): C4, C6, S5, S6,
Workplace Skills (See Appendix B): WP2, WP4, WP6

SECTION II:

CURRICULUM GUIDE

FOR

AUTOMOTIVE TECHNOLOGY

Course Name: Electrical Systems

Course Abbreviation: ATT 1114

Classification: Vocational-Technical Core

Description: This is a course designed to provide advanced skills and knowledge related to all components of the vehicle electrical system including lights, instruments, and charging components. (4 sch: 2 hr. lecture, 4 hr. lab)

Competencies and Suggested Objectives:

1. Apply electrical principles in the diagnosis of automotive circuits.
   a. Use wiring diagrams and test instruments including a test light and multimeter (digital and analog), to check continuity, voltage, voltage drop, resistance, and current flow in an automotive circuit; determine needed repairs.
   b. Inspect and test switches, relays, sending units, connectors, wires, and safety devices (fuses, circuit breakers, and fusible links) of automotive circuits; determine needed repairs.
   c. Check electrical circuits using jumper wires, and determine needed repairs.
   d. Measure and diagnose the cause(s) of abnormal key-off battery drain; determine needed repairs.
   e. Find shorts, grounds, opens, and high resistance problems in automotive circuits; determine needed repairs.

   Related Academic Topics (See Appendix A): C2, M4, S6
   Workplace Skills (See Appendix B): WP2, WP4, WP5
2. Perform starting and charging system diagnosis and repair.
   a. Diagnose starting system problems, including inspecting and testing relays and solenoids, and conducting a starter free-running (bench) test; determine and make needed repairs.
   b. Diagnose charging system problems, including inspecting and testing the voltage regulator and disassembling, cleaning, inspecting, and testing alternator components. Repair/replace as needed

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
3. Perform lighting system diagnosis and repair.
   a. Inspect, diagnose, and repair/replace lighting system problems related to headlights, taillights, and turn signals. Make needed repairs.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6

4. Perform diagnosis and repair on gauges, warning devices, and driver information systems.
   a. Inspect, test, and diagnose gauge circuit problems. Repair/replace as needed.
   b. Inspect and test sensors, sending units, connectors, and wires of electronic digital instrument clusters. Repair/replace as needed.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
5. Perform diagnosis and repair on electrical accessory circuits.
   a. Diagnose abnormal wiper/washer operation. Repair/replace components as needed.
   b. Diagnose abnormal operation in electric motor driven accessories (power windows, power seats, power locks, etc.); make needed repairs.
   c. Diagnose abnormal operation of the cruise control system; repair as needed.
   d. Inspect and test electrical fan control systems and circuits.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Brakes

Course Abbreviation: ATT 1213

Classification: Vocational-Technical Core

Description: This is a course designed to provide advanced skills and knowledge related to the repair and maintenance of brake systems on automobiles. It includes instruction and practice in diagnosis of braking systems problems and the repair of brake systems. (3 sch: 2 hr. lecture, 2 hr. lab)

Competencies and Suggested Objectives:

1. Perform hydraulic system diagnosis and repair.
   a. Diagnosis problems in the hydraulic system, and determine needed repairs.
   b. Inspect, test, and replace hydraulic control valves in the brake system, including metering, proportioning, pressure differential, and combination valves.
   c. Inspect, test, and replace components of the brake warning light system.
   d. Check master cylinder for internal and external leaks and proper operation. Repair/replace as needed.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
2. Perform drum and disk brake diagnosis and repair.
   a. Remove, recondition/replace, and reinstall wheel cylinders.
   b. Remove, recondition/replace, and reinstall a disc caliper.
   c. Clean and inspect rotor, and measure rotor with a dial indicator and micrometer.

   Related Academic Topics (See Appendix A): C1, C2, M4, S6
   Workplace Skills (See Appendix B): WP5, WP6
3. Perform power assist units diagnosis and repair.
   a. Inspect, test, and service power assist unit as needed including adjusting pedal free travel, vacuum supply, and vacuum leaks and checking valve.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
4. Perform miscellaneous diagnosis and repair.
   a. Diagnose wheel bearing problems and determine needed repairs.
   b. Inspect and service the parking brake system including checking brake cables, adjusting cables, and checking warning lights.
   c. Check and adjust/repair the brake stop light system.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6

5. Perform anti-lock brake (ABS) system diagnosis and repair.
   a. Inspect, test, and service ABS brake system hydraulic, electrical, and mechanical components.
   b. Diagnose poor stopping, wheel lock-up, pedal feel, pulsation, and noise problems caused by the ABS system; and determine needed repairs.
   c. Observe the ABS warning light(s) during start-up; and determine if further diagnosis is needed.
   d. Diagnose ABS electronic control(s) and components using self-diagnosis and/or recommended test equipment, and determine needed repairs.
   e. De-pressurize integral (high pressure) components of the ABS following manufacturer's recommended procedures.
   f. Fill the ABS master cylinder with recommended fluid following manufacturer's procedures, and inspect systems for leaks.
   g. Bleed the ABS front and rear hydraulic circuits following manufacturer's procedures.
   h. Perform a fluid pressure (hydraulic boost) diagnosis on the integral (high pressure) ABS, and determine needed repair.
   i. Remove and reinstall ABS electrical/electronic components following manufacturer's procedures and specifications.
   j. Service, test, and adjust ABS speed sensors following manufacturer's recommended procedures.

   Related Academic Topics (See Appendix A): C1, C2, M4, S6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Manual Drive Trains/Transaxles

Course Abbreviation: ATT 1315

Classification: Vocational-Technical Core

Description: This is a course designed to provide advanced skills and knowledge related to the maintenance and repair of manual transmissions, transaxles, and drive train components. It includes instruction in the diagnosis of drive train problems, and the repair and maintenance of transmissions, transaxles, clutches, CV joints, differentials, and other components. (5 sch: 2 hr. lecture, 6 hr. lab)

Competencies and Suggested Objectives:

1. Perform clutch diagnosis and repair.
   a. Diagnose clutch problems including noise, binding, slippage, pulsation, and chatter problems; determine needed repairs.
   b. Measure flywheel-to-block runout and crankshaft end play; determine needed repairs.
   c. Inspect engine block, clutch (bell) housing, and transmission case mating surfaces; determine needed repairs.
   d. Measure clutch (bell) housing bore-to-bore crankshaft runout and face squareness; determine needed repairs.

   Related Academic Topics (See Appendix A): C1, C2, M4, S6
   Workplace Skills (See Appendix B): WP5, WP6
2. Perform manual transmission diagnosis and repair.
   a. Diagnose problems in manual transmission operation including noise, hard shifting, jumping out of gear, and fluid leakage.
   b. Remove, disassemble, clean, inspect, make needed repairs, reassemble, and reinstall a manual transmission.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
3. Perform manual transaxle diagnosis and repair.
   a. Diagnose manual transaxle problems including noise, hard shifting, jumping out of gear, and fluid leakage; determine needed repairs.
   b. Remove, disassemble, clean, inspect, make needed repairs or replace, reassemble, and reinstall a manual transaxle.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
4. Perform manual drive train and axle service.
   a. Diagnose front wheel drive wheel bearing noise and vibration problems; determine needed repairs.
   b. Inspect, service, and replace front wheel drive and rear wheel drive shafts, yokes, and boots.

Related Academic Topics (See Appendix A): C1, C2, S6
Workplace Skills (See Appendix B): WP5, WP6

5. Perform rear axle diagnosis and repair.
   a. Diagnose noise, vibration, and leakage problems in the rear axle; determine needed repairs.
   b. Remove, disassemble, clean, inspect, make needed repairs, reassemble, and reinstall a rear axle assembly.
   c. Compare the operation of a conventional differential to the operation of a limited slip differential.
   d. Diagnose problems in the rear axle shafts, bearings, and seals, including noise, vibration, and fluid problems; make needed repairs.
   e. Measure rear axle flange runout and shaft endplay; determine needed repairs.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
6. Perform four-wheel drive service.
   a. Diagnose four-wheel drive assembly noise, vibration, and unusual steering problems; determine needed repairs.
   b. Inspect, service, and replace front-wheel drive bearings and locking hubs.
   c. Check four-wheel drive assembly seals and vents, and check lube level.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Basic Fuel Systems

Course Abbreviation: ATT 1513

Classification: Vocational-Technical Core

Description: This is a course designed to provide advanced skills and knowledge related to the repair, maintenance, and adjustment of conventional carburetion systems and emission control. It includes instruction in the diagnosis and repair/adjustment of carburetors and conventional emission control systems. (3 sch: 2 hr. lecture, 2 hr. lab)

Competencies and Suggested Objectives:

1. Perform carburetor diagnosis, adjustment, and repair.
   a. Diagnose problems associated with a carburetor including hot or cold starting problems, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emission problems.
   b. Check/adjust idle speed and fuel mixture where applicable.
   c. Remove, inspect, and test vacuum and electrical components of fuel system; repair/replace as needed.
   d. Remove, disassemble, clean and inspect, repair, install, test, and adjust a carburetor to manufacturer's specifications.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
2. Perform conventional emission control system maintenance.
   a. Inspect and test positive crankcase ventilation filter/breather cap, valve, tubes, orifices, and hoses; service or replace as needed.
   b. Inspect and test the exhaust gas recirculation system components including EGR valves, hoses, and passages; service or replace as needed.
   c. Inspect and test components of the air injection and catalytic converter system; repair or replace as needed.
   d. Diagnose the cause of problems in the intake air temperature control system, and make needed repairs.
   e. Inspect and test components and hoses of early fuel evaporation control systems; service or replace as needed.
   f. Inspect and test components and hoses of evaporative emissions control systems; service or replace as needed.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Basic Engine Performance

Course Abbreviation: ATT 1414

Classification: Vocational-Technical Core

Description: This is a course designed to provide advanced skills and knowledge related to the maintenance and adjustment of gasoline engines for optimum performance. It includes instruction and practice in the diagnosis and correction of problems associated with poor performance. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Electrical Systems (ATT 1114)

Competencies and Suggested Objectives:

1. Perform general engine diagnosis.
   a. Interpret and verify complaint; determine needed repairs.
   b. Perform engine vacuum tests; determine needed repairs.
   c. Perform cylinder power balance test; determine needed repairs.
   d. Diagnose engine mechanical, electrical, electronic, fuel, and ignition problems using an engine analyzer.
   e. Prepare and test vehicle using 4-gas analyzer; obtain exhaust readings.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
2. Perform distributor-type ignition system diagnosis and repair.
   a. Diagnose problems in a distributor-type ignition system to include no-starting, hard starting, misfire, poor driveability, spark knock, power loss, and poor mileage; determine needed repairs.
   b. Inspect and test the distributor; service as needed.
   c. Inspect and test ignition coil(s); replace as needed.
   d. Inspect and test ignition system pick-up sensor or triggering device and ignition control module; replace as needed.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Engine Repair

Course Abbreviation: ATT 1715

Classification: Vocational-Technical Core

Description: This is a course designed to provide advanced skills and knowledge related to the repair and rebuilding of automotive-type engines. It includes instruction and practice in the diagnosis and repair of engine components including valve trains, blocks, pistons and connecting rods, crankshafts, and oil pumps. (5 sch: 2 hr. lecture, 6 hr. lab)

Competencies and Suggested Objectives:

1. Perform general engine diagnosis and removal.
   a. Diagnose the cause of unusual oil consumption, unusual engine exhaust color, odor, and sound; determine needed repair.
   b. Remove an engine and prepare for disassembly.
   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
2. Perform cylinder head and valve train diagnosis and repair.
   a. Remove, recondition, and reassemble a cylinder head assembly including:
      i. Remove the cylinder head and valve train assembly.
      ii. Inspect the cylinder head and gasket surface areas for cracks or warps, determine needed actions.
      iii. Inspect valve springs and guides for wear; determine needed repairs.
      iv. Inspect valves and valve seats for wear; determine needed repairs.
      v. Inspect other valve train components, including rocker arms, push rods, rocker arm pivots, and shafts for wear; determine needed repairs.
      vi. Inspect lifters, camshafts, camshaft bearings, timing chain/belt, timing tensioners, and sprockets for wear; determine needed repairs.
      vii. Reassemble the cylinder head assembly.
   Related Academic Topics (See Appendix A): C1, C2, M4, S6
   Workplace Skills (See Appendix B): WP5, WP6
3. Perform engine block diagnosis and repair.
   a. Disassemble the engine block assembly.
   b. Inspect engine block for cracks and general condition; determine needed actions.
   c. Clean, inspect, and repair internal and external threads as needed.
   d. Inspect, measure, and recondition cylinders as needed.
   e. Inspect and measure crankshaft and associated bearings; determine needed repairs.
   f. Inspect, measure, and service/replace pistons and piston rings.

g. Inspect, measure, and service/replace crankshaft vibration dampener, flywheel or flexplate, and crankshaft pilot bearing.

Related Academic Topics (See Appendix A): C1, C2, M4, S6
Workplace Skills (See Appendix B): WP5, WP6

4. Perform engine lubrication system diagnosis and repair.
   a. Perform engine oil pressure tests; determine needed repairs.
   b. Inspect oil pump assembly; determine needed actions.

   Related Academic Topics (See Appendix A): C1, C2
   Workplace Skills (See Appendix B): WP5, WP6
5. Reassemble and reinstall the engine assembly.
   a. Reassemble the engine components using correct gaskets and sealants.
   b. Prime engine lubrication system.
   c. Reinstall an engine.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
6. Perform cooling system diagnosis and repair.
   a. Inspect, test, and replace water pump.
   b. Clean, inspect, test, and replace fan(s) (electrical and mechanical), fan clutch, and fan shroud.
   c. Collect, handle, store, and dispose of used coolant according to current regulations and guidelines.

   Related Academic Topics (See Appendix A): C1, C2, S5, S6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Computer Controlled Emission Systems

Course Abbreviation: ATT 2524

Classification: Vocational-Technical Core

Description: This is a course designed to provide technical skills and knowledge related to the inspection and repair/adjustment of automobile carburetors and emission systems. It includes instruction and practice in the diagnosis and correction of problems associated with computerized carburetors, emission control systems, and spark timing controls found on newer model fuel systems. (4 sch: 2 hr. lecture, 4 hr. lab)

Prerequisites: Electrical Systems (ATT 1114) and Basic Fuel Systems (ATT 1513)

Competencies and Suggested Objectives:

1. Perform computer control service.
   a. Inspect and test power and ground circuits and connections; service or replace as needed.
   b. Practice recommended precautions when handling static sensitive devices.
   c. Perform diagnostic procedures on vehicles with on-board or self-diagnostic computer systems; determine needed repairs.
   d. Test oxygen sensor; remove and replace if needed.
   e. Test, inspect, and adjust the operation of the idle speed control system.
   f. Inspect, test, clean, adjust, and replace components of the closed-loop carburetor fuel control system.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
2. Perform computerized emission control system service.
   a. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation systems; repair or replace as needed.
   b. Inspect and test electrical/electronically-operated components and circuits of air injection systems; replace as needed.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
3. Perform spark timing control service.
   a. Diagnose the cause(s) of emissions problems resulting from the failure of the spark timing control system.
   b. Inspect and test circuits of spark timing control systems; replace as needed.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Heating and Air Conditioning

Course Abbreviation: ATT 2614

Classification: Vocational-Technical Core

Description: This course is designed to provide advanced skills and knowledge associated with the maintenance and repair of automotive heating and air conditioning systems. It includes instruction and practice in the diagnosis and repair of heating and air conditioning system components, and control systems. (4 sch: 2 hr. lecture, 4 hr. lab)

Competencies and Suggested Objectives:
(NOTE: All practices and procedures related to the servicing of a sealed refrigeration system **must** be performed under the direct supervision of an instructor who has been certified to service air conditioning and refrigeration equipment. All practices and procedures **must** be performed according to current mandates and standards regarding the servicing of refrigerant systems.)

1. Perform refrigerant recovery, recycling, and handling procedures.
   a. Compare differences in procedures for handling and using different refrigerants.
   b. Verify correct operation of refrigerant handling equipment.
   c. Identify and recover A/C system refrigerant.
   d. Recycle refrigerant.
   e. Label and store refrigerant.
   f. Test recycled refrigerant for non-condensable gases.
   Related Academic Topics (See Appendix A): C1, C2, S5, S6
   Workplace Skills (See Appendix B): WP5, WP6
2. Perform general A/C diagnosis and repair.
   a. Diagnose the cause of unusual operating noises in the A/C system; determine needed repairs.
   b. Conduct performance test of the A/C system (includes pressure gauge readings, visual inspection, and touch procedures); determine needed repairs.
   c. Inspect the condition of oil, select proper oil type, and measure and add oil to A/C system as needed.
   Related Academic Topics (See Appendix A): C1, C2, M4, S5, S6
   Workplace Skills (See Appendix B): WP5, WP6
3. Perform refrigeration system component diagnosis and repair.
   a. Diagnose A/C system problems that cause the pressure protection devices to interrupt system operation; repair as needed.
   b. Remove A/C compressor; inspect/test pulley, clutch, compressor shaft seals; and repair as needed.

c. Remove and inspect A/C system filters, hoses, lines, fittings, o-rings, seals, and service valves; replace as needed.
d. Inspect A/C condenser for air flow restrictions, and service as required.
e. Inspect receiver/drier or accumulator/drier; replace as needed.
f. Inspect and test the expansion valve or orifice (expansion) tube; replace as needed.
g. Inspect evaporator housing water drain, and repair as needed.

Related Academic Topics (See Appendix A): C1, C2, S5, S6
Workplace Skills (See Appendix B): WP5, WP6

4. Perform operating system and related control diagnosis and repair.
   a. Diagnose the cause of temperature control problems in the heater/ventilation system; determine needed repairs.
   b. Diagnose the cause of failures in the electrical controls of heating and A/C systems; determine needed repairs.
   c. Inspect and test A/C-heater blower assembly; repair or replace as needed.
   d. Inspect A/C compressor load cut-off systems; determine needed repairs.
   e. Diagnose the cause of failures in the vacuum and mechanical controls of the heating and A/C system; determine needed repairs.
   f. Inspect and test the control panel and vacuum control system; determine needed repairs.

   Related Academic Topics (See Appendix A): C1, C2, S5, S6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Automatic Transmissions/Transaxles

Course Abbreviation: ATT 2325

Classification: Vocational-Technical Core

Description: This is a course designed to provide technical skills and knowledge related to the diagnosis and repair of automotive-type automatic transmissions and transaxles. It includes instruction and practice in testing and inspecting these devices and in disassembly, repair, and reassembly. (5 sch: 3 hr. lecture, 4 hr. lab)

Competencies and Suggested Objectives:

1. Perform general transmission and transaxle diagnosis.
   a. Interpret and verify driver's complaint; determine needed repairs.
   b. Diagnose unusual fluid usage, level, and condition problems; determine needed repairs.
   c. Perform diagnostic tests (pressure test, stall tests, and lock-up converter tests); determine needed repairs.
   d. Diagnose mechanical and vacuum control systems; determine needed repairs.

   Related Academic Topics (See Appendix A): C1, C2, C3, S5, S6
   Workplace Skills (See Appendix B): WP3, WP5, WP6
2. Perform in-vehicle automatic transmission and transaxle maintenance, adjustment, and repair.
   a. Inspect, adjust, or replace manual shift linkage and throttle linkages or cables (as applicable).
   b. Inspect, adjust, or replace (as applicable) vacuum modulator, lines, and hoses.
   c. Inspect, repair, and replace governor cover, seals, sleeve, valve, weights, springs, retainers, and gear.
   d. Inspect and replace external seals and gaskets, extension housing, and speedometer drive components.
   e. Inspect, leak test, flush, and replace cooler, lines, and fittings.
   f. Inspect, test, adjust, repair, or replace transmission related electrical components (includes computers, solenoids, sensors, relays, and switches).
   g. Inspect, measure, repair, and replace valve body, servo bore, and accumulator bore components as needed.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
3. Perform off-vehicle transmission and transaxle repair.
   a. Remove, disassemble, clean, and inspect a transmission and torque converter assembly.

b. Service the oil pump and converter including inspecting converter flex plate assembly, measuring torque converter end play, and inspecting the oil pump assembly; make needed repairs.
c. Service the gear train, shafts, bushings, and case including:
    i. Checking end play or preload
    ii. Inspecting thrust washers and bearings
    iii. Inspecting oil delivery seals
    iv. Inspecting bushings
    v. Inspecting planetary gear assembly
    vi. Inspecting cases, bores, passages, bushings, vents, and mating services
    vii. Inspecting transaxle drive assembly
    viii. Inspecting transaxle final drive components
    ix. Inspecting parking pawl, shaft, spring, and retainer
    x. Making repairs as needed
d. Service friction and reaction units including:
    i. Bands and drums clutch drum, piston, check balls, springs, retainers, seals, and friction and pressure plates
    ii. Assemble clutch pack, measure clearance, and air test
    iii. Inspect roller and sprag clutch, races, rollers, sprag, springs, cages, and retainers; replace as needed.
e. Reassemble and reinstall a transmission and torque converter assembly.
    i. Reassemble the transmission and torque converter assembly, and reinstall and align in the vehicle.

Related Academic Topics (See Appendix A): C1, C2, S6
Workplace Skills (See Appendix B): WP5, WP6

Course Name: Computerized Engine Controls

Course Abbreviation: ATT 2535

Classification: Vocational-Technical Core

Description: This is a course designed to provide technical skills and knowledge associated with computer controls found in newer cars. It includes instruction and practice in the diagnosis and correction of problems associated with computer controls of the ignition and fuel injection system. (5 sch: 2 hr. lecture, 6 hr. lab)

Prerequisites: Computer Controlled Emission Systems (ATT 2524)

Competencies and Suggested Objectives:

1. Perform computerized engine controls diagnosis and repair.
   a. Diagnose the causes of emission problems caused from failure of the computerized engine control.
   b. Perform analytic/diagnostic procedures on vehicles with on-board diagnostic computer systems; determine needed repairs.
   c. Inspect and test sensors, controls, and actuator components of computerized engine control systems; adjust or replace as needed.
   d. Interpret multimeter readings on computerized engine control components.
   e. Inspect and test power and ground circuits and connections; service or replace as needed.
   f. Practice recommended precautions when handling static sensitive devices.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP2, WP5, WP6
2. Perform electronic ignition system diagnosis and repair.
   a. Diagnose electronic ignition problems including no starting, hard starting, poor driveability, spark knock, power loss, poor mileage, etc.
   b. Inspect and test electronic ignition (distributorless) primary circuit (low voltage) components; repair or replace as needed.
   c. Inspect and test electronic ignition (distributorless) secondary circuit (high voltage) components; repair or replace as needed.
   d. Inspect and test ignition coils; replace as needed.
   e. Inspect and test ignition wiring harness and connectors; replace as needed.
   f. Inspect and test ignition system pick-up sensor and triggering devices; replace as needed.
   g. Inspect and test ignition control module; replace as needed.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP2, WP5, WP6

3. Perform electronic fuel injection system diagnosis and repair.
   a. Diagnose electronic fuel injection system problems including hot or cold no starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, etc.
   b. Inspect and test fuel pressure regulation system and components of injection type fuel systems; adjust or replace as needed.
   c. Inspect and test cold enrichment system components; adjust or replace as needed.
   d. Remove, clean, and install the throttle body; adjust related linkages.
   e. Inspect and test fuel injectors; clean or replace as needed.
   f. Inspect throttle body mounting plates, air induction and filtration system, intake manifold, and gaskets; clean or replace as needed.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP2, WP5, WP6
4. Perform other computerized control diagnosis and repair.
   a. Retrieve trouble codes from the supplemental restraint system (SRS).

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP2, WP5, WP6

Course Name: Steering and Suspension Systems

Course Abbreviation: ATT 2334

Classification: Vocational-Technical Core

Description: This is a course designed to provide advanced skills and knowledge related to the inspection and repair of steering and suspension systems on automobiles. It includes instruction and practice in the diagnosis of steering system problems and the repair/replacement of steering systems components. (4 sch: 2 hr. lecture, 4 hr. lab)

Competencies and Suggested Objectives:

1. Perform steering system diagnosis and repair.
   a. Disable supplemental restraint systems (SRS) in accordance with manufacturer's procedures.
   b. Diagnose non-rack and pinion steering gear problems; determine needed repairs.
   c. Diagnose rack and pinion steering gear problems; determine needed repairs.
   d. Diagnose steering shaft/column problems; make needed repairs.
   e. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.
   f. Adjust rack and pinion steering gear.
   g. Inspect and replace rack and pinion steering gear inner tie rods, ends, and bellows boots.
   h. Inspect steering fluid levels and condition.
   i. Diagnose power steering fluid leakage; determine needed repairs.
   j. Remove, inspect, and replace power steering pump, pump mounts, pump seals, gaskets, and pulley.
   k. Inspect and replace power steering hoses and fittings.
   l. Inspect and replace as needed, conventional steering system components (pitman arms, idler arms, tie rod ends, tie rod sleeves, etc.)

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6
2. Perform front suspension service.
   a. Diagnose short and long arm suspension system noises, body sway, and uneven riding height problems; determine needed repairs.
   b. Diagnose MacPherson strut suspension system noises, body sway, and uneven riding height problems; determine needed repairs.
   c. Remove, inspect, and replace (as necessary) upper and lower control arms, bushings, shafts, and rebound bumpers.
   d. Remove, inspect, replace (if necessary), and adjust strut rods and bushings.
   e. Remove, inspect, and replace (if necessary) upper and lower ball joints.

f. Remove, inspect, and replace (if necessary) steering knuckle assemblies.
g. Remove, inspect, and replace (if necessary) suspension coil springs and spring insulators.
h. Remove, inspect, and replace (if necessary), or adjust torsion bars and inspect mounts.
i. Remove, inspect, and replace (if necessary) stabilizer bar bushings, brackets, and links.
j. Remove, inspect, and replace (if necessary) MacPherson strut cartridge or assembly, strut coil spring, and insulators.
k. Remove, inspect, and replace ball joints on MacPherson strut suspension systems.

Related Academic Topics (See Appendix A): C1, C2, S6
Workplace Skills (See Appendix B): WP5, WP6

3. Perform rear suspension service.
   a. Remove, inspect, and replace coil springs and spring insulators.
   b. Remove, inspect, and replace (if necessary) transverse links, control arms, bushings, and mounts.
   c. Remove, inspect, and replace (if necessary) leaf springs, insulators, shackles, brackets, bushings, and mounts.
   d. Remove, inspect, and replace (if necessary) MacPherson strut cartridge or assembly, strut coil spring, and insulators.
   e. Inspect and replace (if necessary) shock absorbers.

   Related Academic Topics (See Appendix A): C1, C2, S6
   Workplace Skills (See Appendix B): WP5, WP6

Course Name: Wheel Alignment

Course Abbreviation: ATT 2343

Classification: Vocational-Technical Core

Description: This is a course designed to provide technical skills and knowledge related to the alignment of both front and rear wheel on automobiles. It includes instruction and practice in the inspection, detection, and correction of wheel alignment problems. (3 sch: 1 hr. lecture, 4 hr. lab)

Pre/Corequisites: Steering and Suspension Systems (ATT 2334)

Competencies and Suggested Objectives:

1. Perform wheel alignment diagnosis, adjustment, and repair.
   a. Diagnose wheel and tire vibration (shimmy and tramp) problems; determine needed repairs.
   b. Diagnose vehicle wandering, pulling, hard steering, and poor steering return problems; determine needed repairs.
   c. Measure vehicle ride height; determine need repairs.
   d. Check and adjust front and rear wheel camber (where applicable); make needed repairs and adjustments.
   e. Check and adjust caster (where applicable); make needed repairs or adjustment.
   f. Check and adjust front wheel toe; adjust as needed.
   g. Center steering wheel.
   h. Check toe-out-on-turns (turning radius); determine needed repairs/adjustments.
   i. Check SAI (steering axis inclination)/KPI (king pin inclination) and included angle; determine needed repairs.
   j. Check and adjust (where applicable) rear wheel toe.
   k. Check rear wheel thrust angle; determine needed repairs.
   l. Check front wheel setback; determine needed repairs.
   m. Check front wheel cradle (subframe) alignment; determine needed repairs.

   Related Academic Topics (See Appendix A): C1, C2, M4, M5, S6
   Workplace Skills (See Appendix B): WP5, WP6

SECTION III:

RECOMMENDED TOOLS AND EQUIPMENT

RECOMMENDED TOOLS AND EQUIPMENT FOR POSTSECONDARY AUTOMOTIVE TECHNOLOGY

1. Student Tool Kit (1 kit per 2 students)
   a. Adjustable wrenches (2) 6" and 12"
   b. Allen wrench sets - standard (.050" - 3/8") and Metric (2mm - 7mm)
   c. Brake spoon
   d. Chisels - cape (5/16") and cold (3/8" & 3/4")
   e. Claw type pickup tool
   f. Combination wrench sets - standard (1/4" - 1") and metric (7mm - 19 mm)
   g. Continuity test light (12v)
   h. Feeler gauge (blade type) .002" - .040 " and .006 mm - .070 mm
   i. Hack saw
   j. Hammer - 16 oz. ball peen
   k. Hammer - plastic tip
   l. Ignition wrench set - US and metric
   m. Magnetic pickup tool
   n. Pliers - combination 6", locking jaw, needle nose, side cutting, and slip joint (water pump)
   o. Punches - center, brass drift, pin (1/8", 3/16", 1/4", 5/16") , and taper (3/8", 1/2", 5/8")
   p. Scrapers - carbon 1" and gasket 1"
   q. Screwdrivers - standard (stubby, 6", 9", 12", and offset) and Phillips (stubby #1, #2; 6" #1, #2; 12" #3)
   r. Screw starters - standard and Phillips
   s. Socket set - 1/4" drive - 1/4"-1/2" standard sockets, 1/4"-1/2" deep sockets, 6mm-12mm standard sockets, 6mm-12mm deep sockets, flex/universal type handle, 3" and 6" extensions, ratchet
   t. Socket set - 3/8" drive - 5/16"-3/4" standard sockets; 3/8"-3/4" deep sockets; 9mm-19mm standard sockets; 9mm-19mm deep sockets; 3", 6", 12", and 18" extensions; flexhead ratchet; ratchet; speed handle; universal joint; spark plug sockets (5/8" & 13/16")
   u. Socket set - 1/2" drive - 7/16" - 1 1/8" standard sockets; 7/16" - 1 1/8" deep sockets; 10mm-25mm standard sockets; 10mm-25mm deep sockets; 3",6", and 12" extensions; flex/universal type handle, ratchet
   v. Spark plug feeler gauge (gap tool)
2. Air blow gun (OSHA approved) (2 per program)
3. Battery post cleaner (2 per program)
4. Battery terminal pliers (2 per program)
5. Battery terminal puller (2 per program)
6. Files - coarse 6"&12", fine 6"&12", half-round 12", and round 6" & 12" (2 sets per program)

7. Flare nut (tubing wrenches) 3/8" - 3/4" and 10mm - 17mm (1 set per program)
8. Flashlight (4 per program)
9. Hammer - dead blow plastic mallet (1 per program)
10. Jumper wire set (1 per 2 students)
11. Pliers - hose clamp (1 per program)
12. Pry bars - rolling head and straight (2 each per program)
13. Screwdriver set - Posidrive® #1-#4 (1 set per program)
14. Screwdriver set - Torx® T-8 - T-55 (2 sets per program)
15. 3/8" drive air ratchet (1 per program)
16. 3/8" drive impact sockets (US and metric) (2 sets per program)
17. 3/8" drive impact wrench (1 per program)
18. 3/8" drive flexible socket set (US and metric) (1 set per program)
19. 1/2" drive air impact wrench (2 per program)
20. 1/2" drive impact sockets (US and metric) (2 sets per program)
21. Air chisel with various bits (1 per program)
22. Air compressor and hoses (1 per program)
23. Axle stands (1 set per service bay)
24. Battery charger/booster starter (2 per program)
25. Belt tensioner gauge (2 per program)
26. Bench or pedestal grinder (2 per program)
27. Compression tester (2 per program)
28. Computer scan tool (hand held) - on-board diagnostics level II with adapters and cartridges for various systems and manufacturers (4 per program)
29. Cooling system pressure tester (1 per program)
30. Floor creeper (1 per service bay)
31. Cylinder leakage tester (1 per program)
32. Dial indicator with flex arm and clamp base (2 per program)
33. Digital multimeter with various leadsets (1 per 2 students)
34. Drain/drip pans (1 per service bay)
35. Drill - 3/8" variable speed (2 per program)
36. Drill - 1/2" variable speed (1 per program)
37. Extension cords (1 per service bay)
38. Fender covers (1 set per service bay)
39. Floor jack (1 1/2 ton minimum capacity) (4 per program)
40. Gear lube dispenser (1 per program)
41. Hand held vacuum pump (2 per program)
42. Hoist(s)-Engine (2 per program)
43. Hot plate (or equivalent) (1 per program)
44. Hydraulic press with adapters (25 ton) (1 per program)
45. Jumper cables (1 set per program)
46. Master puller set (1 per program)
47. Microcomputer with monitor, printer, CD-ROM drive and cables (1 per program)

48. Outside Micrometers (0-1", 1-2", 2-3", 3-4", 4-5") (2 sets per program)
49. Oil can - pump type (1 per program)
50. Oil filter wrench(es) (1 set of various sizes)
51. Parts cleaning tank (2 per program)
52. Pressure washer (1 per program)
53. Remote starter switch (1 per program)
54. Screw extractor set (1 per program)
55. Seat covers (1 set per service bay)
56. Snap ring pliers set - external and internal (1 per program)
57. Soldering gun (1 per program)
58. Soldering iron (25 watt pencil type) (1 per program)
59. Spark plug boot puller (5 per program)
60. Steel top workbenches with vises (1 per 2 students)
61. Tach/dwell meter (1 per program)
62. Tap and die set (US and metric) (1 set per program)
63. Thread repair insert kit (1 per program)
64. Tire inflator chuck (2 per program)
65. Trouble/work lights (1 per 2 students)
66. Tube quick disconnect tool set (1 per program)
67. Tubing cutter and flaring set (1 per program)
68. Twist steel drill bit set (1/64" - 1/2") (2 sets per program-US; 1 set per program-metric)
69. Valve core removal tool (2 per program)
70. Vernier calipers (0-6" and 0-125mm) (1 per program)
71. Waste oil receptacle (1 per program)
72. Ball joint press (1 per program)
73. Bearing packer (1 per program)
74. Brake pedal holder (1 per program)
75. Drag link tool (1 per program)
76. Inner tie rod end tool (1 per program)
77. Pitman arm puller (1 per program)
78. Shock absorber tools (1 set per program)
79. Spring/strut compressor tool (1 per program)
80. Tie rod puller (1 per program)
81. Tire mounting machine (1 per program)
82. Wheel alignment equipment - 4 wheel alignment with rack and alignment tools (1 per program)
83. Wheel balancer (1 per program)
84. Wheel weight pliers (1 per program)
85. Brake bleeder, pressure (1 per program)
86. Brake cylinder clamps (1 per program)
87. Brake disc micrometer (1 per program)
88. Brake drum micrometer (1 per program)
89. Brake lathe with disc service attachments (1 per program)

90. Brake shoe adjusting gauge (1 per program)
91. Brake spring installers (1 per program)
92. Brake spring pliers (1 per program)
93. Asbestos containment/removal device (1 per program)
94. Refrigerant recovery/recycling machines (r-12 and HFC-134a) (1 each per program)
95. Air conditioner repair unit - pullers, removers, adapters, special feeler gauges, necessary hoses, leak detector, circuit tester, thermometer, ratchet, and dispenser valves (1 per program)
96. Portable vacuum pump (2 per program)
97. A/C service port adapter set (1 per program)
98. Manifold gauge set (2 per program)
99. Antifreeze tester (1 per program)
100. Battery/starter/charging system tester (1 per program)
101. Carburetor plug and angle gauge set (1 per program)
102. Computer carburetor tools (1 per program)
103. Dual trace lab scope (1 per program)
104. Engine analyzer - Basic unit capable of reading secondary voltage on conventional, electronic, and DIS ignition systems, conducting cylinder balance tests, and cylinder burn time test (1 per program)
105. Four-gas exhaust analyzer (1 per program)
106. Fuel injector pressure gauge sets with adapters and pulse tester (1 per program)
107. Oxygen sensor socket (1 per program)
108. Sending unit socket (1 per program)
109. Spark plug thread tap (1 per program)
110. Static strip (4 per program)
111. Timing advance light (2 per program)
112. Vacuum/pressure gauge set (2 per program)
113. Hydraulic pressure gauge set (1 per program)
114. Front wheel drive engine support fixture (2 per program)
115. Power Train (cradle) removal and installation tool (1 per program)
116. Transmission jack(s) (1 per program)
117. Transmission holding fixtures (2 per program)
118. Transmission special tools set (1 per program)
119. Alternator service tools (1 set per program)
120. Connector pick tool set (1 per program)
121. Wire and terminal repair kit (1 per program)
122. Clutch alignment set (1 per program)
123. Clutch pilot puller set (1 per program)
124. Special tools for transaxles (1 set per program)
125. Universal joint tools (1 per program)
126. Ball gauges (1 per program)
127. Cam bearing driver set (1 per program)

128. Cylinder deglazer (1 set of various sizes)
129. Dial bore indicator (1 per program)
130. Engine stands/benches (4 per program)
131. Ridge reamer (1 per program)
132. Ring compressor (2 per program)
133. Ring expander (2 per program)
134. Ring groove cleaner (2 per program)
135. Telescopic gauge set (1 per program)
136. Torque angle gauge (1 per program)
137. Valve and valve seat resurfacing equipment (1 per program)
138. Valve guide repair unit (1 per program)
139. Valve spring compressor (2 per program)
140. Valve spring tester (1 per program)

RECOMMENDED INSTRUCTIONAL AIDS/RESOURCES

1. Microcomputer service information software package (CD-ROM)
2. TV/monitor
3. VCR

APPENDIX A:

RELATED ACADEMIC TOPICS

APPENDIX A

RELATED ACADEMIC TOPICS FOR COMMUNICATIONS

C1 Interpret written material.
C2 Interpret visual materials (maps, charts, graphs, tables, etc.).
C3 Listen, comprehend, and take appropriate actions.
C4 Access, organize, and evaluate information.
C5 Use written and/or oral language skills to work cooperatively to solve problems, make decisions, take actions, and reach agreement.
C6 Communicate ideas and information effectively using various oral and written forms for a variety of audiences and purposes.

EXPANDED TOPICS FOR COMMUNICATIONS

TOPIC C1: Interpret written material.

C1.01 Read and follow complex written directions.
C1.02 Recognize common words and meanings associated with a variety of occupations.
C1.03 Adjust reading strategy to purpose and type of reading.
C1.04 Use sections of books and reference sources to obtain information.
C1.05 Compare information from multiple sources and check validity.
C1.06 Interpret items and abbreviations used in multiple forms.
C1.07 Interpret short notes, memos, and letters.
C1.08 Comprehend technical words and concepts.
C1.09 Use various reading techniques depending on purpose for reading.
C1.10 Find, read, understand, and use information from printed matter or electronic sources.

TOPIC C2: Interpret visual materials (maps, charts, graphs, tables, etc.).

C2.01 Use visuals in written and in oral presentations.
C2.02 Recognize visual cues to meaning (layout, typography, etc.).
C2.03 Interpret and apply information using visual materials.

TOPIC C3: Listen, comprehend, and take appropriate action.

C3.01 Identify and evaluate orally-presented messages according to purpose.
C3.02 Recognize barriers to effective listening.
C3.03 Recognize how voice inflection changes meaning.
C3.04 Identify speaker signals requiring a response and respond accordingly.
C3.05 Listen attentively and take accurate notes.
C3.06 Use telephone to receive information.

C3.07 Analyze and distinguish information from formal and informal oral presentations.

TOPIC C4: Access, organize, and evaluate information.

C4.01 Distinguish fact from opinion.
C4.02 Use various print and non-print sources for specialized information.
C4.03 Interpret and distinguish between literal and figurative meaning.
C4.04 Interpret written or oral communication in relation to context and writer's point of view.
C4.05 Use relevant sources to gather information for written or oral communication.

TOPIC C5: Use written and/or oral language skills to work cooperatively to solve problems, make decisions, take actions, and reach agreement.

C5.01 Select appropriate words for communication needs.
C5.02 Use reading, writing, listening, and speaking skills to solve problems.
C5.03 Compose inquiries and requests.
C5.04 Write persuasive letters and memos.
C5.05 Edit written reports, letters, memos, and short notes for clarity, correct grammar, and effective sentences.
C5.06 Write logical and understandable statements, phrases, or sentences for filling out forms, for correspondence or reports.
C5.07 Write directions or summaries of processes, mechanisms, events, or concepts.
C5.08 Select and use appropriate formats for presenting reports.
C5.09 Convey information to audiences in writing.
C5.10 Compose technical reports and correspondence that meet accepted standards for written communications.

TOPIC C6: Communicate ideas and information using oral and written forms for a variety of audiences and purposes.

C6.01 Give complex oral instructions.
C6.02 Describe a business or industrial process/mechanism.
C6.03 Participate effectively in group discussions and decision making.
C6.04 Produce effective oral messages utilizing different media.
C6.05 Explore ideas orally with partners.
C6.06 Participate in conversations by volunteering information when appropriate and asking relevant questions when appropriate.
C6.07 Restate or paraphrase a conversation to confirm one's own understanding.
C6.08 Gather and provide information utilizing different media.

C6.09 Prepare and deliver persuasive, descriptive, and demonstrative oral presentations.

RELATED ACADEMIC TOPICS FOR MATHEMATICS

M1 Relate number relationships, number systems, and number theory.
M2 Explore patterns and functions.
M3 Explore algebraic concepts and processes.
M4 Explore the concepts of measurement.
M5 Explore the geometry of one-, two-, and three-dimensions.
M6 Explore concepts of statistics and probability in real world situations.
M7 Apply mathematical methods, concepts, and properties to solve a variety of real-world problems.

EXPANDED TOPICS FOR MATHEMATICS

TOPIC M1: Relate number relationships, number systems, and number theory.

M1.01 Understand, represent, and use numbers in a variety of equivalent forms (integer, fraction, decimal, percent, exponential, and scientific notation) in real world and mathematical problem situations.
M1.02 Develop number sense for whole numbers, fractions, decimals, integers, and rational numbers.
M1.03 Understand and apply ratios, proportions, and percents in a wide variety of situations.
M1.04 Investigate relationships among fractions, decimals, and percents.
M1.05 Compute with whole numbers, fractions, decimals, integers, and rational numbers.
M1.06 Develop, analyze, and explain procedures for computation and techniques for estimations.
M1.07 Select and use an appropriate method for computing from among mental arithmetic, paper-and-pencil, calculator, and computer methods.
M1.08 Use computation, estimation, and proportions to solve problems.
M1.09 Use estimation to check the reasonableness of results.

TOPIC M2: Explore patterns and functions.

M2.01 Describe, extend, analyze, and create a wide variety of patterns.
M2.02 Describe and represent relationships with tables, graphs, and rules.
M2.03 Analyze functional relationships to explain how a change in one quantity results in a change in another.
M2.04 Use patterns and functions to represent and solve problems.
M2.05 Explore problems and describe results using graphical, numerical, physical, algebraic, and verbal mathematical models or representations.

M2.06 Use a mathematical idea to further their understanding of other mathematical ideas.
M2.07 Apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as art, music, and business.

TOPIC M3: Explore algebraic concepts and processes.

M3.01 Represent situations and explore the interrelationships of number patterns with tables, graphs, verbal rules, and equations.
M3.02 Analyze tables and graphs to identify properties and relationships and to interpret expressions and equations.
M3.03 Apply algebraic methods to solve a variety of real world and mathematical problems.

TOPIC M4: Explore the concepts of measurement.

M4.01 Estimate, make, and use measurements to describe and compare phenomena.
M4.02 Select appropriate units and tools to measure to the degree of accuracy required in a particular situation.
M4.03 Extend understanding of the concepts of perimeter, area, volume, angle measure, capacity, and weight and mass.
M4.04 Understand and apply reasoning processes, with special attention to spatial reasoning and reasoning with proportions and graphs.

TOPIC M5: Explore the geometry of one-, two-, and three-dimensions.

M5.01 Identify, describe, compare, and classify geometric figures.
M5.02 Visualize and represent geometric figures with special attention to developing spatial sense.
M5.03 Explore transformations of geometric figures.
M5.04 Understand and apply geometric properties and relationships.
M5.05 Classify figures in terms of congruence and similarity and apply these relationships.

TOPIC M6: Explore the concepts of statistics and probability in real world situations.

M6.01 Systematically collect, organize, and describe data.
M6.02 Construct, read, and interpret tables, charts, and graphs.
M6.03 Develop an appreciation for statistical methods as powerful means for decision making.
M6.04 Make predictions that are based on exponential or theoretical probabilities.

M6.05 Develop an appreciation for the pervasive use of probability in the real world.

TOPIC M7: Apply mathematical methods, concepts, and properties to solve a variety of real-world problems.

M7.01 Use computers and/or calculators to process information for all mathematical situations.
M7.02 Use problem-solving approaches to investigate and understand mathematical content.
M7.03 Formulate problems from situations within and outside mathematics.
M7.04 Generalize solutions and strategies to new problem situations.

RELATED ACADEMIC TOPICS FOR SCIENCE

S1 Explain the Anatomy and Physiology of the human body.
S2 Apply the basic biological principles of Plants, Viruses and Monerans, Algae, Protista, and Fungi.
S3 Relate the nine major phyla of the kingdom anomaly according to morphology, anatomy, and physiology.
S4 Explore the chemical and physical properties of the earth to include Geology, Meteorology, Oceanography, and the Hydrologic Cycle.
S5 Investigate the properties and reactions of matter to include symbols, formulas and nomenclature, chemical equations, gas laws, chemical bonding, acid-base reactions, equilibrium, oxidation-reduction, nuclear chemistry, and organic chemistry.
S6 Explore the principles and theories related to motion, mechanics, electricity, magnetism, light energy, thermal energy, wave energy, and nuclear physics.
S7 Explore the principles of genetic and molecular Biology to include the relationship between traits and patterns of inheritance, population genetics, the structure and function of DNA, and current applications of DNA technology.
S8 Apply concepts related to the scientific process and method to include safety procedures for classroom and laboratory; use and care of scientific equipment; interrelationships between science, technology and society; and effective communication of scientific results in oral, written, and graphic form.

EXPANDED TOPICS FOR SCIENCE

TOPIC S1: Explain the Anatomy and Physiology of the human body.

S1.01 Recognize common terminology and meanings.
S1.02 Explore the relationship of the cell to more complex systems within the body.

S1.03 Summarize the functional anatomy of all the major body systems.
S1.04 Relate the physiology of the major body systems to its corresponding anatomy.
S1.05 Compare and contrast disease transmission and treatment within each organ system.
S1.06 Explore the usage of medical technology as related to human organs and organ systems.
S1.07 Explain the chemical composition of body tissue.

TOPIC S2: Apply the basic biological principles of Plants, Viruses and Monerans, Algae, Protista, and Fungi.

S2.01 Identify the major types and structures of plants, viruses, monera, algae protista, and fungi.
S2.02 Explain sexual and asexual reproduction.
S2.03 Describe the ecological importance of plants as related to the environment.
S2.04 Analyze the physical chemical and behavioral process of a plant.

TOPIC S3: Relate the nine major phyla of the kingdom anomaly according to morphology, anatomy, and physiology.

S3.01 Explain the morphology, anatomy, and physiology of animals.
S3.02 Describe the characteristics, behaviors, and habitats of selected animals.

TOPIC S4: Explore the chemical and physical properties of the earth to include Geology, Meteorology, Oceanography, and the Hydrologic Cycle.

S4.01 Examine minerals and their identification, products of the rock cycle, byproducts of weathering, and the effects of erosion.
S4.02 Relate the Hydrologic Cycle to include groundwater its zones, movement, and composition; surface water systems, deposits, and runoff.
S4.03 Consider the effects of weather and climate on the environment.
S4.04 Examine the composition of seawater; wave, tides, and currents; organisms, environment, and production of food; energy, food and mineral resources of the oceans.

TOPIC S5: Investigate the properties and reactions of matter to include symbols, formulas and nomenclature, chemical equations, gas laws, chemical bonding, acid-base reactions, equilibrium, oxidation-reduction, nuclear chemistry, and organic chemistry.

S5.01 Examine the science of chemistry to include the nature of matter, symbols, formulas and nomenclature, and chemical equations.

S5.02 Identify chemical reactions including precipitation, acids-bases, and reduction-oxidation.
S5.03 Explore the fundamentals of chemical bonding and principles of equilibrium.
S5.04 Relate the behavior of gases.
S5.05 Investigate the structure, reactions, and uses of organic compounds; and investigate nuclear chemistry and radiochemistry.

TOPIC S6: Explore the principles and theories related to motion, mechanics, electricity, magnetism, light energy, thermal energy, wave energy, and nuclear physics.

S6.01 Examine fundamentals of motion of physical bodies and physical dynamics.
S6.02 Explore the concepts and relationships among work, power, and energy.
S6.03 Explore principles, characteristics, and properties of electricity, magnetism, light energy, thermal energy, and wave energy.
S6.04 Identify principles of modern physics related to nuclear physics.

TOPIC S7: Explore the principles of genetic and molecular Biology to include the relationship between traits and patterns of inheritance; population genetics, the structure and function of DNA, and current applications of DNA technology.

S7.01 Examine principles, techniques, and patterns of traits and inheritance in organisms.
S7.02 Apply the concept of population genetics to both microbial and multicellular organism.
S7.03 Identify the structure and function of DNA and the uses of DNA technology in science, industry, and society.

TOPIC S8: Apply concepts related to the scientific process and method to include safety procedures for classroom and laboratory; use and care of scientific equipment; interrelationships between science, technology and society; and effective communication of scientific results in oral, written, and graphic form.

S8.01 Apply the components of scientific processes and methods in classroom and laboratory investigations.
S8.02 Observe and practice safe procedures in the classroom and laboratory.
S8.03 Demonstrate proper use and care for scientific equipment.
S8.04 Investigate science careers, and advances in technology.
S8.05 Communicate results of scientific investigations in oral, written, and graphic form.

APPENDIX B:

WORKPLACE SKILLS

APPENDIX B
WORKPLACE SKILLS FOR THE 21ST CENTURY

WP1 Allocates resources (time, money, materials and facilities, and human resources).

WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.

WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.

WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.

WP5 Selects, applies, and maintains/troubleshoots technology.

WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.

APPENDIX C:

STUDENT COMPETENCY PROFILE

STUDENT COMPETENCY PROFILE

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each course. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the program.

In the blank before each competency, place the date on which the student mastered the competency.

Electrical Systems (ATT 1114)

_____ 1. Apply electrical principles in the diagnosis of automotive circuits.
_____ 2. Perform starting and charging system diagnosis and repair.
_____ 3. Perform lighting system diagnosis and repair.
_____ 4. Perform diagnosis and repair on gauges, warning devices, and driver information systems.
_____ 5. Perform diagnosis and repair on electrical accessory circuits.

Brakes (ATT 1213)

_____ 1. Perform hydraulic system diagnosis and repair.
_____ 2. Perform drum and disk brake diagnosis and repair.
_____ 3. Perform power assist units diagnosis and repair.
_____ 4. Perform miscellaneous diagnosis and repair.
_____ 5. Perform anti-lock brake (ABS) system diagnosis and repair.

Manual Drive Trains/Transaxles (ATT 1315)

_____ 1. Perform clutch diagnosis and repair.
_____ 2. Perform manual transmission diagnosis and repair.
_____ 3. Perform manual transaxle diagnosis and repair.
_____ 4. Perform manual drive train and axle service.
_____ 5. Perform rear axle diagnosis and repair.
_____ 6. Perform four-wheel drive service.

Basic Fuel Systems (ATT 1513)

_____ 1. Perform carburetor diagnosis, adjustment, and repair.
_____ 2. Perform conventional emission control system maintenance.

Basic Engine Performance (ATT 1414)

_____ 1. Perform general engine diagnosis.
_____ 2. Perform distributor-type ignition system diagnosis and repair.

Engine Repair (ATT 1715)

_____ 1. Perform general engine diagnosis and removal.
_____ 2. Perform cylinder head and valve train diagnosis and repair.
_____ 3. Perform engine block diagnosis and repair.
_____ 4. Perform engine lubrication system diagnosis and repair.
_____ 5. Reassemble and reinstall the engine assembly.
_____ 6. Perform cooling system diagnosis and repair.

Computer Controlled Emission Systems (ATT 2524)

_____ 1. Perform computer control service.
_____ 2. Perform computerized emission control system service.
_____ 3. Perform spark timing control service.

Heating and Air Conditioning (ATT 2614)

_____ 1. Perform refrigerant recovery, recycling, and handling procedures.
_____ 2. Perform general A/C diagnosis and repair.
_____ 3. Perform refrigeration system component diagnosis and repair.
_____ 4. Perform operating system and related control diagnosis and repair.

Automatic Transmissions/Transaxles (ATT 2325)

_____ 1. Perform general transmission and transaxle diagnosis.
_____ 2. Perform in-vehicle automatic transmission and transaxle maintenance, adjustment, and repair.
_____ 3. Perform off-vehicle transmission and transaxle repair.

Computerized Engine Controls (ATT 2535)

_____ 1. Perform computerized engine controls diagnosis and repair.
_____ 2. Perform electronic ignition system diagnosis and repair.
_____ 3. Perform electronic fuel injection system diagnosis and repair.
_____ 4. Perform other computerized control diagnosis and repair.

Steering and Suspension Systems (ATT 2334)

_____ 1. Perform steering system diagnosis and repair.

_____ 2. Perform front suspension service.
_____ 3. Perform rear suspension service.

Wheel Alignment (ATT 2343)

_____ 1. Perform wheel alignment diagnosis, adjustment, and repair.